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GB 2018708 A GB 1109977 A GB 1068184 A
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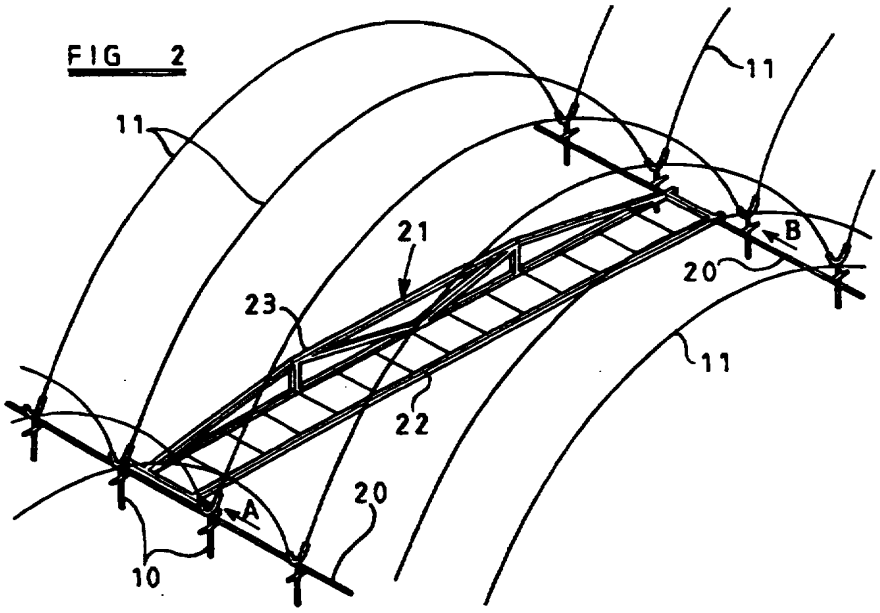
(54) Abstract Title
Gantry system with rails

(57) The system, for use in a temporary or semi-permanent structure e.g. for growing fruit, vegetables, horticultural products, comprises two substantially parallel rows of spaced support posts 10 and two parallel rails 20 each of which extends along one of the rows of support posts and is rigidly mounted on them. A movable gantry 21 extends transversely between the rails 20 and has mounted on its ends wheel assemblies which are engageable with the rails respectively and arranged to remain in engagement with the rails as the gantry moves along them. The wheel assembly at one end of the gantry 21 is slidably mounted on the gantry so as to accommodate variations in the spacing between the rails 20 along their length. The support posts 10 also constitute a structural part of the temporary or semi-permanent structure, arched roof beams 11 extending between opposite support posts 10 and supporting a flexible roof covering.

FIG 2



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

FIG 1

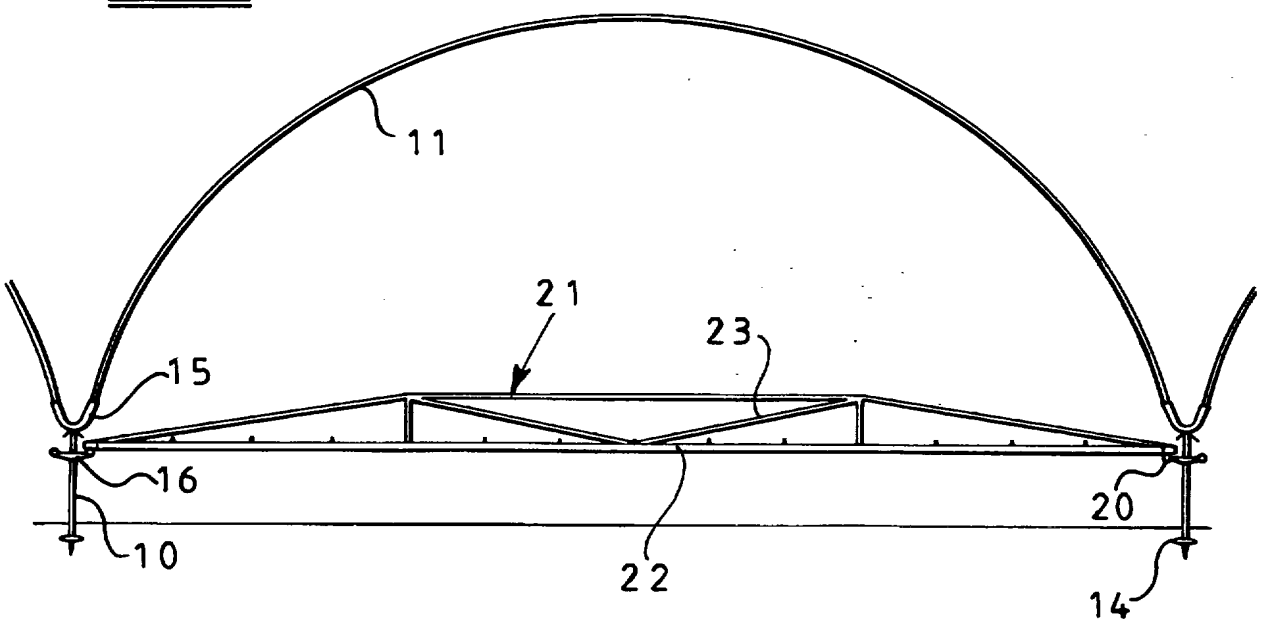


FIG 2

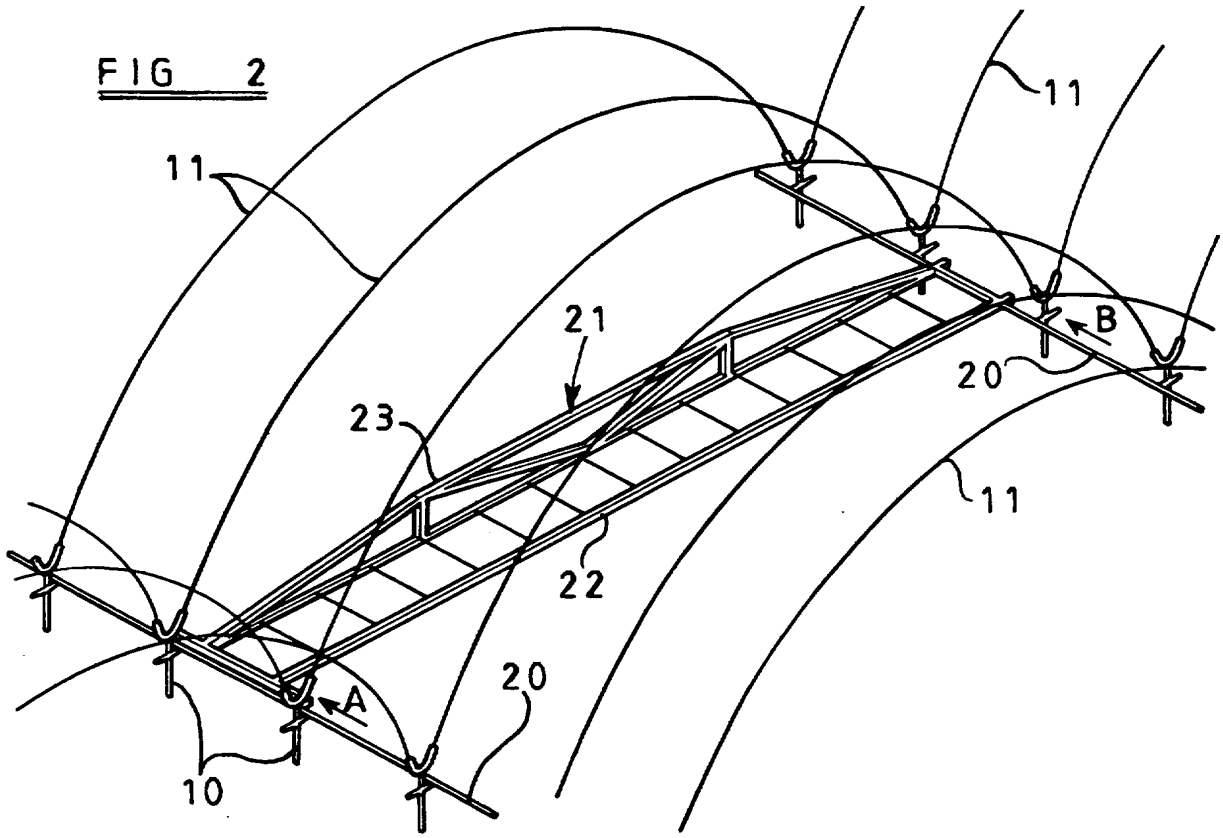


FIG 3

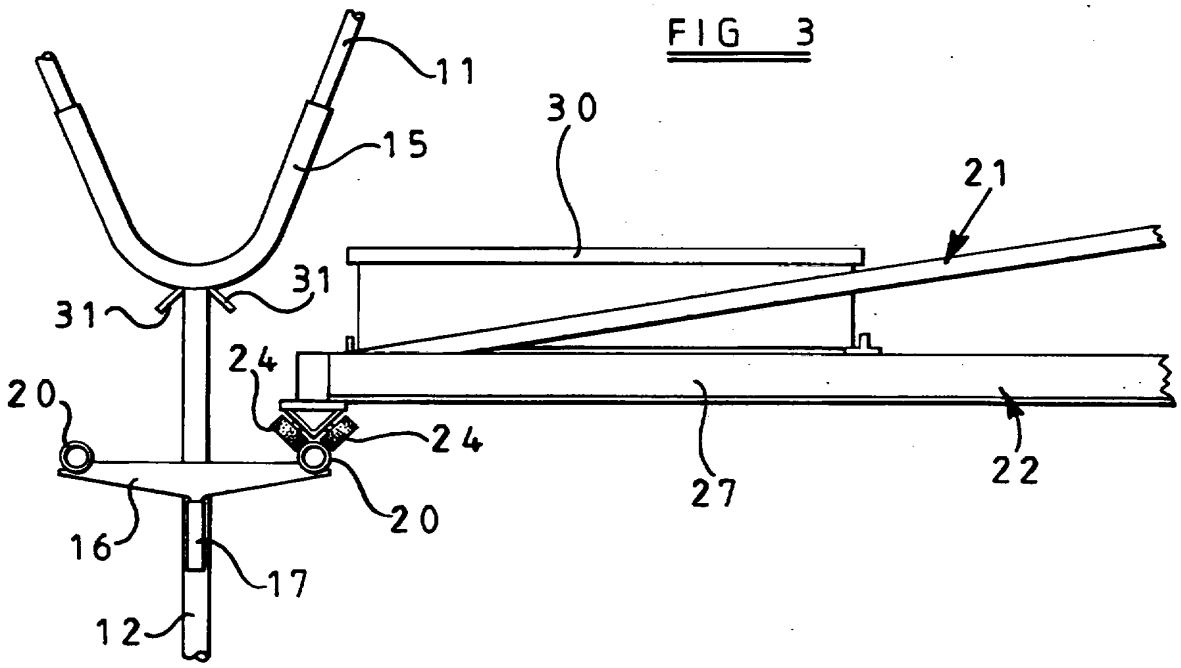


FIG 4

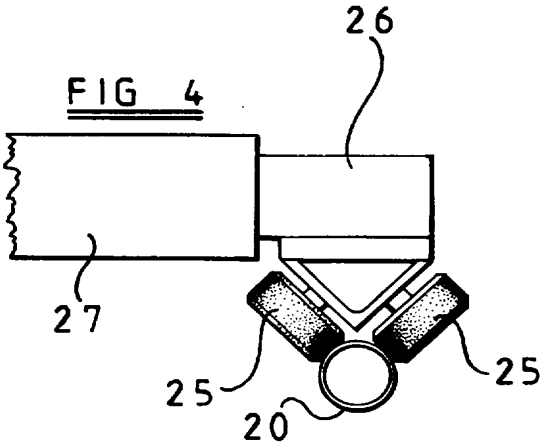
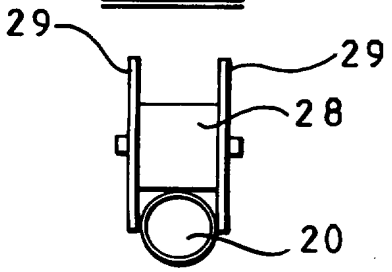


FIG 5



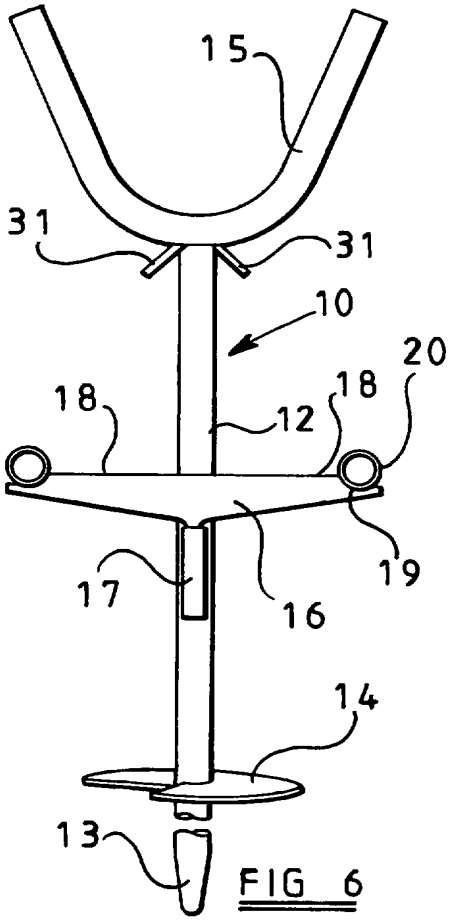


FIG 6

"A gantry system for use in a temporary or semi-permanent structure"

The invention relates to a gantry system for use in a temporary or semi-permanent structure.

The invention is particularly, but not exclusively, applicable to temporary or semi-permanent enclosed structures of the kind in which fruit, vegetables or other horticultural products are grown in quantity in a controlled environment. In one known structure of this type parallel rows of support posts are driven into the ground and corresponding posts in adjacent rows are interconnected by arched roof elements which are then covered with translucent flexible plastics coverings to form an arched roof. Such structures can be very large, each roof section spanning a width of 6.5 metres and having an overall length of 250 metres. Any number of such structures can be erected side-by-side so as to cover an extremely large area. Accordingly very large quantities of produce can be grown within such structures. The produce may be grown at ground level or on raised tables arranged in parallel rows along the length of the structure.

During growth of the produce they may need spraying and eventually it is necessary to pick and perhaps package the crop. In order to facilitate such processes, the invention sets out to provide a gantry system suitable for use in such a structure, whereby a movable gantry may extend across the full width of the structure and may easily be moved the full length of the structure so as to provide a convenient platform on which equipment can be supported and carried for such operations as spraying crops and picking and packaging them. The gantry may also be used to facilitate conveyance of the crops and associated equipment to their respective places within the structure,

during the initial setting up of production.

Although gantry systems are in general well known and are frequently used in permanent building structures, such as engineering works and storage complexes, particular difficulties arise in providing a gantry system in a temporary or semi-permanent structure due, for example, to the large dimensional tolerances which may apply in the erection of the structure and to variations in the dimensions of the structure which may occur over the course of time, for example due to variable weather conditions. The invention therefore sets out to provide a novel form of gantry system where problems of this nature may be overcome.

According to the invention there is provided a gantry system for use in a temporary or semi-permanent structure, comprising two substantially parallel rows of spaced support members, two parallel rails each of which extends along one of the rows of support members and is mounted on at least some of the support members in the row, and a gantry extending transversely between the rails and having mounted thereon two spaced wheel assemblies which are engageable with the rails respectively, means being provided to maintain the wheel assemblies in engagement with the rails as the gantry moves longitudinally thereof.

Preferably at least one of the wheel assemblies is mounted on the gantry so as to be freely movable longitudinally of the gantry and transversely of the rails, so as to remain in engagement with its respective rail regardless of variations in the distance between the rails.

The movable wheel assembly may be mounted on a member which is

longitudinally slidable with respect to a fixed part of the gantry. For example, the slidable member may be an elongate member which is telescopically slidable within a fixed tubular part of the gantry. The elongate member may project telescopically from the end of the gantry.

Each wheel assembly may be arranged to straddle its associated rail, so that the inter-engagement between the wheel assembly and the rail itself constitutes the means for maintaining the wheel assembly in engagement with the rail.

In a preferred embodiment each wheel assembly comprises two wheels mounted on the gantry with their axes of rotation inclined to the vertical so that the peripheries of the wheels engage opposite sides of the rail. Alternatively, each wheel assembly may comprise a single double-flanged wheel so mounted that the flanges of the wheel straddle the rail.

Each rail may conveniently be circular in cross-section, for example it may be in the form of hollow circular tubing. However, other cross-sectional shapes are possible, such as box sections, U-sections, V-sections or I-sections.

The support members on which the rails are mounted may comprise spaced vertical support posts. For example, the support posts may be secured by their lower ends being driven into the ground. In this case each support post may be formed, adjacent its lower end, with a helical structure whereby the lower end of the post may be screwed into the ground.

The rails may be mounted on the support posts by being secured to brackets which are mounted on the posts, the brackets projecting transversely of the support

posts so that the rails are spaced away from the posts.

The rail support brackets may be locatable in a number of different vertical positions on the support posts. Preferably the rails are rigidly connected to the brackets so as to prevent rotational displacement of the support posts about their vertical axes, in use.

Preferably the brackets are detachably mounted on the support posts. For example, each bracket may include a vertical element which is slidably received in a socket mounted on the support post.

Each bracket may have limbs projecting from opposite sides of the support post, so that two rails may be supported along opposite sides of the post.

In any of the above arrangements the gantry may comprise an elongate horizontal support frame extending between the rails, and at least one vertical bracing frame projecting upwardly from the horizontal frame and substantially co-extensive therewith. Thus, in use, plants and equipment may be placed on the horizontal support frame and the gantry may then be moved along the rails to the area where the items are required. For picking the crop, empty and full containers for the produce may be moved along the structure on the gantry as the crops are picked.

In any of the above arrangements the support posts for the gantry may also constitute structural elements of the temporary or semi-permanent structure within which the gantry is provided.

Thus, a roof support element of the structure may extend from each support post in one row of posts to a corresponding support post in the opposite parallel row. The

roof support element may comprise an arched beam of substantially constant cross-section, for example of circular cross-section. In this case the upper part of each support post may be formed with a tubular socket in which one end of the arched beam is received. The upper part of each support post may be formed with two similar sockets inclined to face towards opposite sides of the post, whereby two similar arched beams may be mounted to extend to opposite sides of the post.

As previously described, the temporary or semi-permanent structure may further include a flexible roof covering which extends longitudinally between the parallel rows of support posts, being supported on the roof elements extending between the support posts in the two rows.

The following is a more detailed description of an embodiment of the invention, by way of example, reference being made to the accompanying drawings in which:

Figure 1 is a diagrammatic section through one form of temporary or semi-permanent structure incorporating a gantry system in accordance with the present invention,

Figure 2 is a diagrammatic perspective view of the structure and gantry of Figure 1,

Figure 3 is an enlarged view looking in the direction of arrow A in Figure 2 and showing one end of the gantry,

Figure 4 is a view of the opposite end of the gantry, looking in the direction of the arrow B in Figure 2,

Figure 5 is a view of an alternative form of wheel assembly for supporting the

gantry on the rails, and

Figure 6 is a more detailed view of one of the support posts of the structure.

Referring to Figures 1 and 2, the temporary or semi-permanent structure comprises parallel rows of ground-engaging support posts 10, two such rows being shown in the drawings. Arched roof beams 11 extend from each support post in one row to a corresponding post in an adjacent parallel row. The roof beams are connected together by longitudinal flexible ties (not shown) that help to transfer loads along the completed structure and prevent the spacing between adjacent roof beams from changing due to external loads. A flexible covering is then laid over the arched roof beams and is then tensioned and anchored to the ground. Cross-bracing ropes may be connected from post to post across the structure between adjacent roof assemblies to enhance the rigidity of the structure, as will be described.

As best seen in Figure 6, each support post 10 comprises a central metal tube 12 which is closed and tapered at its lower end, as indicated at 13, so that it may be driven into the ground. A helical plate 14 partly encircles the tube a short distance above the tip 13 and may be screwed into the ground with the tube 12 so as to secure and stabilise the post when it has been driven into the ground. All the posts 10 are screwed into the ground to the same depth.

Welded to the upper end of the tube 12 is a generally U-shaped tubular socket part 15, the two inclined limbs of which receive the ends of the tubular roof beams 11 extending to opposite sides of the post 10. The end portions of the roof beams 11 are left straight to enable them to be easily received within the sockets.

A generally T-shaped rail mounting bracket 16 is detachably mounted on each post 10, the vertical limb of the T-shape being received in a short length of tubing 17 welded to the side of the tube 12 so as to extend longitudinally thereof. The tubing 17 may be round or rectangular in section. The two arms 18 of the bracket extend transversely of the tube 12 and lie generally in the same plane as the U-shaped socket part 15.

The ends of the arms 18 of the bracket 16 are shaped, as indicated at 19 to receive tubular rails 20 of circular cross-section. (Other rail sections are possible, as previously mentioned.) The rails 20 are preferably rigidly secured to the brackets 16, for example by welding or by detachable clamps or bolts, so as to impart rigidity to each row of support posts and to prevent rotational displacement of individual support posts.

The bracket mounting tubes 17 are so positioned on the posts as to locate the rails 20 at the desired height above the ground. If desired, the tube 17 may be adjustable between alternative vertical positions on the posts to facilitate adjustment of the height of the rails.

As shown in Figures 1 and 2, a gantry 21 extends between the rails 20 and is supported by wheel assemblies mounted on the ends of the gantry. The gantry comprises an elongate horizontal base frame 22 from one side of which extends a vertical bracing frame 23 which is co-extensive with the base frame.

Figure 3 shows one of the wheel assemblies mounted on one end of the gantry 21 to support the gantry on a rail 20. Two such wheel assemblies are mounted on the underside of the horizontal frame member 22 of the gantry and are spaced apart fore-

and-aft in the direction of movement of the gantry along the rails.

As shown in Figure 3, each wheel assembly at this end of the gantry comprises two wheels 24 which are mounted on the gantry for rotation about axes which are inclined at 90° to one another so that the peripheries of the two wheels 24 engage opposite sides of the rail 20 so as to locate the wheels, and hence the gantry, laterally with respect to the rail 20 as the wheels roll along the rail.

Figure 4 shows one of the two modified wheel assemblies at the opposite end of the gantry. At this end the two wheels 25 of each assembly, which are similarly configured to the wheels 24 so as to engage opposite sides of the rail 20, are mounted on the underside of a member 26 which is free to slide telescopically within one of the two longitudinal frame members 27 of the horizontal base frame 22 of the gantry.

Since the configuration of the wheels 24 and 25 maintains them in engagement with the rails 20 as the gantry rolls along the rails, the member 26 can slide in and out of the gantry frame member 27 as necessary, as the gantry rolls along the rails 20, to compensate for variations in the spacing between the parallel rails. Such variations are likely to arise due both to dimensional variations in the initial erection of the temporary structure and also as a result of loads to which the structure is subjected during its life, for example as a result of weather conditions.

Instead of the inclined pairs of wheels shown in Figures 3 and 4, other forms of wheel assembly can be used. For example, Figure 5 shows an arrangement where each wheel assembly comprises a wheel 28 which is formed with two parallel side flanges 29 which embrace the rail 20 so as to maintain the wheel in engagement with the rail. As

in the previously described arrangement the wheels 28 mounted at one end of the gantry will be mounted on sliding members of the gantry frame to compensate for variations in the spacing between the rails as the gantry moves along the rails.

Although the gantry may be moved along the rails simply by being pushed, power driven arrangements are possible where one or more of the wheels which engage the rails are driven, for example by an electric motor mounted on the gantry. Movement of the gantry along the rails may then be remotely controlled if required.

The gantry may thus be easily moved to transport crops or equipment to and from any part of the structure. For example, in Figure 3 a picking tray 30 is shown supported on the horizontal lower frame member of the gantry.

As previously mentioned, cross-bracing ropes may extend across each section of the structure to brace it. Two bracing ropes extends across the roof from each support post 10 to the two support posts in the parallel row which are displaced one position in each direction longitudinally from the post from which the bracing rope extends. Thus the bracing ropes extend in crossing zig-zag fashion from one side of the structure to the other along the length thereof. The cross-bracing ropes are connected to the support posts 10 by being attached to small bars 31 which are welded at an angle of 45° to the top of the post 10 below the U-shaped socket part 15, as best seen in Figures 3 and 6.

socket provided by the socket part 15.

Typically the width of each structure may be 6.5 metres and the length up to 250 metres. The longitudinal spacing between the support posts 10 in each row of posts

may be about 2 metres.

In the arrangement described above the load bearing wheels 24, 25 or 28 themselves constitute the means for maintaining the wheels in engagement with the rails. However, other means may be provided for this purpose. For example, the sides of the rails may be engaged by further non-load-bearing wheels mounted on the gantry.

CLAIMS

1. A gantry system for use in a temporary or semi-permanent structure, comprising two substantially parallel rows of spaced support members, two parallel rails each of which extends along one of the rows of support members and is mounted on at least some of the support members in the row, and a gantry extending transversely between the rails and having mounted thereon two spaced wheel assemblies which are engageable with the rails respectively, means being provided to maintain the wheel assemblies in engagement with the rails as the gantry moves longitudinally thereof.

2. A gantry system according to Claim 1, wherein at least one of the wheel assemblies is mounted on the gantry so as to be freely movable longitudinally of the gantry and transversely of the rails, so as to remain in engagement with its respective rail regardless of variations in the distance between the rails.

3. A gantry system according to Claim 2, wherein the movable wheel assembly is mounted on a member which is longitudinally slidable with respect to a fixed part of the gantry.

4. A gantry system according to Claim 3, wherein the slidable member is an elongate member which is telescopically slidable within a fixed tubular part of the gantry.

5. A gantry system according to Claim 4, wherein the elongate member projects telescopically from the end of the gantry.

6. A gantry system according to any of the preceding claims, wherein each wheel assembly is arranged to straddle its associated rail, so that the inter-engagement between the wheel assembly and the rail itself constitutes the means for maintaining the wheel assembly in engagement with the rail.

7. A gantry system according to Claim 6, wherein each wheel assembly comprises two wheels mounted on the gantry with their axes of rotation inclined to the vertical so that the peripheries of the wheels engage opposite sides of the rail.

8. A gantry system according to Claim 6, wherein each wheel assembly comprises a single double-flanged wheel so mounted that the flanges of the wheel straddle the rail.

9. A gantry system according to any of the preceding claims, wherein each rail is circular in cross-section.

10. A gantry system according to any of the preceding claims, wherein the support members on which the rails are mounted comprise spaced vertical support posts.

11. A gantry system according to Claim 10, wherein the support posts are secured by their lower ends being driven into the ground.

12. A gantry system according to Claim 11, wherein each support post is formed, adjacent its lower end, with a helical structure whereby the lower end of the post may be screwed into the ground.

13. A gantry system according to any of Claims 10 to 12, wherein the rails are mounted on the support posts by being secured to brackets which are mounted on the posts, the brackets projecting transversely of the support posts so that the rails are spaced away from the posts.

14. A gantry system according to Claim 13, wherein the rail support brackets are locatable in a number of different vertical positions on the support posts.

15. A gantry system according to Claim 13 or Claim 14, wherein the rails are rigidly connected to the brackets so as to prevent rotational displacement of the support posts about their vertical axes, in use.

16. A gantry system according to any of Claims 13 to 15, wherein the brackets are detachably mounted on the support posts.

17. A gantry system according to Claim 16, wherein each bracket includes a vertical element which is slidably received in a socket mounted on the support post.

18. A gantry system according to any of Claims 13 to 17, wherein each bracket has limbs projecting from opposite sides of the support post, so that two rails may be supported along opposite sides of the post.

19. A gantry system according to any of the preceding claims, wherein the gantry comprises an elongate horizontal support frame extending between the rails, and at least one vertical bracing frame projecting upwardly from the horizontal frame and substantially co-extensive therewith.

20. A temporary or semi-permanent structure incorporating a gantry system according to any of the preceding claims in which the support members on which the rails are mounted comprise spaced vertical support posts, wherein the support posts for the gantry also constitute structural elements of the temporary or semi-permanent structure within which the gantry is provided.

21. A structure according to Claim 20, wherein a roof support element of the structure extends from each support post in one row of posts to a corresponding support post in the opposite parallel row.

22. A structure according to Claim 21, wherein each roof support element comprises an arched beam of substantially constant cross-section.

23. A structure according to Claim 22, wherein the upper part of each support post is formed with a tubular socket in which one end of the arched beam is received.

24. A structure according to Claim 23, wherein the upper part of each support post is formed with two similar sockets inclined to face towards opposite sides of the post, whereby two similar arched beams may be mounted to extend to opposite sides of the post.

25. A structure according to any of Claims 21 to 24, wherein the structure further includes a flexible roof covering which extends longitudinally between the parallel rows of support posts, being supported on the roof elements extending between the support posts in the two rows.

26. A gantry system, for a temporary or semi-permanent structure, substantially as hereinbefore described with reference to the accompanying drawings.

27. A temporary or semi-permanent structure, incorporating a gantry, substantially as hereinbefore described with reference to the accompanying drawings.

The Patent Office

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Application No: GB 9920952.0 **Examiner:** Roger Binding
Claims searched: 1-27 **Date of search:** 17 January 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): B7L (LAA), A1E (EAC, EAE, EAGA, EAGX); B8H (HGMB, HGMC)

Int Cl (Ed.7): B61B 13/00; A01G 9/00, 9/14, 9/16, 9/18, 9/24, 13/04; B25J 5/02, 5/04; B66C 6/00, 7/00, 7/02, 7/04, 7/06, 7/08, 17/00, 19/00

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2018708 A	(NORTHERN ENGINEERING), see Figs 1 to 3 and page 1, lines 105 to 122.	1, 6, 8, 10, 19
X	GB 1109977 A	(GRANT), note especially page 2, lines 29 and 30.	1, 10, 11, 20, 21
X	GB 1068184 A	(BABCOCK & WILCOX)	1, 6, 8, 10
X	GB 0933352 A	(BRITISH FEDERAL WELDER), see Figs 15 and 16.	1, 10, 13-15
X	US 5669518 A	(KUNDEL)	1, 10, 13-16
X	US 5645395 A	(HUANG), see especially Figs 1 and 2.	1, 6, 8

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.